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ABSTRACT

Children's reading comprehension of explicit, implicit, and metaphorical information was investigated to determine the effects of grade level and recall task type. After reading prose selections containing the three types of information, 40 second and 40 fifth grade students were assessed on either cued or free recall tasks. Their comprehension was evaluated on the quantity and type of propositional units recalled. The results showed that fifth grade subjects recalled more information than the second grade subjects in all categories. The cued recall means were consistently larger than the free recall means in all categories. Correlations for the explicit, implicit, and metaphor scores for each grade level indicated that second grade students performed equally well on explicit, implicit, or metaphor information. The correlations also indicated that if fifth grade students did well on implicit recall, they would be more likely to do well on metaphor recall. Thus, the findings emphasized (1) the impact that the specific task had on children's recall, and (2) the ability of very young children to comprehend metaphors and make appropriate inferences when provided retrieval cues. (RL)

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EFFECTS OF AGE AND TASK TYPE ON COMPREHENDING EXPLICIT, IMPLICIT AND METAPHORICAL INFORMATION IN WRITTEN TEXT

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Children's reading comprehension was investigated to determine the effects of grade level and recall task type. The effectiveness of two different tasks (free recall and cued recall) were used to assess the type of information (explicit, implicit and metaphorical) evidenced by second graders (age range 7.5 to 8.5) and fifth graders (age range 10.2 to 11.2) after reading prose texts. The children's comprehension was evaluated on the quantity of explicit, implicit and metaphorical propositional units they were able to recover from the original texts under the two types of response conditions and at the two grade levels. Explicit, implicit and metaphor recall scores were used to illustrate qualitative differences in the children's recall. To assess the subjects' quantitative recall, the three recall scores were combined to attain a Total Recall score that represented the total number of propositional units recalled by each subject.

To fully comprehend a message, the reader must not only be able to decode the individual words in the surface structure, but s/he must also be able to understand all of the explicit and implicit relational information found in its deep, semantic structure (Bransford & McCarrell, 1974; Johnson, Bransford & Solomon, 1973; Paris & Carter, 1973; Paris & Mahoney, 1974; Schank, 1976). There is evidence in the literature that this ability may develop with age and experience, with the child first able to extract the explicitly stated information from the text and only later being able to utilize

the implicit information fully (Paris & Lindauer, 1976; Paris, Lindauer & Cox, 1977). Similarly, developmental results have been obtained with metaphors (Asch & Nerlove, 1960; Gardner, Kirscher, Winner & Perkins, 1975; Winner & Gardner, 1977). Both comprehension of text and metaphors have been shown to be influenced by the type of response demanded of the subject. In concert with these findings, the present study was designed to investigate possible relationships between children's cognitive differentiation as a function of grade level, type of recall task required, and type of information comprehended when responding to written text.

Although comprehending any message requires the activation of an appropriate cognitive schema or frame of reference, Black (1962) and Verbrugge (1977) theorized that the interpretation of a metaphor should require the use of two schemata, or domains. Most of the research on the reading processes has dealt with two basic levels of comprehension: (1) explicit, i.e., the directly stated information from a text, and (2) implicit, i.e., information that is implied by the text (Paris & Carter, 1973; Paris & Mahoney, 1974; Paris & Lindauer, 1976; Paris, Lindauer & Cox, 1977). The use of a prose passage with metaphorical language should provide another dimension to research on comprehension by extending the demands on the child to move from using one schema for comprehension to the use of two.

To date, the majority of research on inferencing or understanding metaphors has dealt with isolated sentences (Mistler-Lachman, 1972) or orally presented prose passages

(Johnson, Bransford & Solomon, 1973), and has been largely limited to adult subjects. It has only been within the last few years that researchers, such as Liben and Posnansky (1977) and Paris and Lindauer (1976), have turned to young subjects, and even more recently that researchers such as Kintsch (1977) have tried to deal with natural language materials, or texts, that are most relevant to classroom teachers. Examining children's recall of explicit, implicit and metaphorical information from written text as demonstrated in either a free recall or cued recall task should provide insights into children's reading comprehension processes and possibly illuminate a more productive way for the classroom teacher to structure the reading task to encourage children's use of higher level reasoning skills.

Method

Subjects. Forty subjects at both second and fifth grade levels were selected in a stratified random sample using all three elementary schools from a suburban school system (N=80). Subjects with learning or language disabilities that had been identified by the school, along with all children falling outside the designated age ranges, were eliminated from the list of potential candidates. Once the sample was selected, each participant was assigned to a subgroup, cued recall or free recall, by randomization. This procedure led to the formation of four subgroups: (1) second grade free recall; (2) second grade cued recall; (3) fifth grade free recall; and (4) fifth grade cued recall. Sex was controlled within each subgroup to approximate, as closely as possible, equal numbers of males and females.

Materials. Children's recall of explicit, implicit and metaphorical information was assessed with a test that included four short stories, each with a set of 12 test questions. Each passage, constructed to simulate natural classroom reading materials, consisted of ten sentences, one of which was a one sentence metaphor of the type used in Verbrugge and McCarrell's (1977) adult study, "Topic is (like) Vehicle." Both topic and vehicle were represented by noun phrases that were explicitly stated in the text. Verbrugge and McCarrell's (1977) metaphor pattern forces the reader to infer the common traits or attributes being compared. This inference is referred to as the common Ground of the metaphor.

Procedure. The four text passages were presented to the subjects in individual interviews. All directions were read to the subjects prior to handing them the passages. Following silent reading of each passage, the children were asked to respond to either a cued (question cues) or a free recall task.

Each individual interview was tape-recorded for transcription later. The typed transcription of each child's session was then analyzed for its semantic or propositional content. Each recalled proposition in each of the three categories, explicit, implicit and metaphor, received one point of credit. This analysis rendered four distinct scores for each student: an Explicit score, an Implicit score, a Metaphor score and a Total Recall score. The first three scores delineated the qualitative differences in recall, while the final score illuminated the quantitative recall differences.

Results

A series of two-way analysis of variances with grade level and type of recall task as the two independent variables and scores on the four measures of propositional recall, explicit, implicit, metaphor and Total Recall scores, as the dependent variables supported the anticipated differences between the grade levels on each of the dependent measures: (1) Explicit, F (1,76) = 32.110, $p < .01$; (2) Implicit, F (1,76) = 7.248, $p < .01$; (3) Metaphor, F (1,76) = 17.686, $p < .01$; and (4) Total Recall, F (1,76) = 22.310, $p < .01$. There were significant differences found between second and fifth grade children's recall of all three types of information and on their Total Recall scores. Fifth grade subjects recalled more information than the second grade subjects in all categories.

Similarly, the main effects for task type, free and cued recall, reached significance on all four dependent variables: (1) Explicit, F (1,76) = 15.024, $p < .01$; (2) Implicit, F (1,76) = 89.190, $p < .01$; (3) Metaphor, F (1,76) = 325.075, $p < .01$; and (4) Total Recall, F (1,76) = 116.355, $p < .01$. There was a significant difference between the mean scores on each of the four dependent measures for cued and free recall tasks, across grade level. The cued recall means were consistently larger than the free recall means in all categories. None of the interactions of grade level and task type on any of the four dependent measures reached significance at the .01 level.

To determine the relationships of the three types of recall scores to each other, a series of Pearson Product-Moment correlations were computed on the Explicit, Implicit and Metaphor scores for each grade level. Significant relationships were found for second grade children on Explicit and Implicit recall scores ($r = +.72$), Explicit and Metaphor scores ($r = +.70$) and Implicit and Metaphor scores ($r = +.84$). Explicit and Implicit recall scores for the fifth grade children were significantly correlated ($r = +.43$), as were the Implicit and Metaphor scores ($r = +.81$). The fifth graders' Explicit and Metaphor recall scores were positively correlated, $r = +.22$. The second grade correlations indicate that children of that age range do equally well on Explicit information as they do on Implicit or Metaphor information. If the fifth graders do well on recalling the Explicit information, it does not necessarily mean that they will do well on Implicit or Metaphor recall; however, if the fifth grade children do well on Implicit recall, they are more likely to do well on Metaphor recall.

Discussion

The findings of this study emphasized: (1) the impact the specific task had on children's recall preformances, and (2) the ability of very young children to comprehend metaphors and make appropriate inferences when provided retrieval cues. Even though both second and fifth grade children recalled all three types of information after reading, both grade levels benefited significantly from structured probe questions that

provided the retrieval cues essential to the recovery of information from memory. This point is readily apparent from the data analyses summarized in Table 16. It was previously unclear as to whether young children are cognitively capable of comprehending metaphors and making inferences from explicit text premises. Our results show that with the support provided by carefully structured questions, young children are capable of both tasks. While they do experience difficulty in expressing their thoughts and in retrieving the appropriate information on their own (free recall), young children can effectively utilize external memory retrieval cues. In fact, appropriate retrieval cues were essential for consistent expression of metaphorical understanding.

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Table 1

Analysis of Variance of Explicit Recall Scores
by Two Grade Levels and Two Task Types

Source of Variation	Sums of Squares	df	Mean Squares	F
Between cells	6958.852	3		
Grade Level	4147.199	1	4147.199	32.110*
Task Type	1940.450	1	1940.450	15.024*
Grade Level by Task Type	871.202	1	871.202	6.745
Within cells	9815.898	76	129.157	
Total	16774.750	79		

* $F_{.01}(1,76) = 7.08$

Table 2

Analysis of Variance of Implicit Recall Scores
by Two Grade Levels and Two Task Types

Source of Variation	Sums of Squares	df	Mean Squares	F
Between cells	32934.939	3		
Grade Level	2475.313	1	2475.313	7.248*
Task Type	30459.014	1	30459.014	89.190*
Grade Level by Task Type	.613	1	.613	.002
Within cells	25954.549	76	341.507	
Total	58889.488	79		

* $F_{.01}(1,76) = 7.08$

Table 3

Analysis of Variance of Metaphor Recall Scores
by Two Grade Levels and Two Task Types

Source of Variation	Sums of Squares	df	Mean Squares	F
Between cells	8584.300	3		
Grade Level	441.800	1	441.800	17.686*
Task Type	8120.450	1	8120.450	325.075*
Grade Level by Task Type	22.050	1	22.050	.883
Within cells	1898.500	76	24.980	
Total	10482.800	79		

* $F_{.01}(1,76) = 7.08$

Table 4

Analysis of Variance of Total Recall Test Scores by Two Grade Levels and Two Task Types

Source of Variation	Sums of Squares	df	Mean Squares	F
Between cells	114137.840	3		
Grade Level	18271.016	1	18271.016	22.310*
Task Type	95289.016	1	95289.016	116.355*
Grade Level by Task Type	577.813	1	577.813	.706
Within cells	62240.344	76	818.952	
Total	176378.190	79		

* $F_{.01}(1,76) = 7.08$

Table 5

Correlations Between Explicit, Implicit and Metaphor Scores for Second Graders

	Explicit	Implicit	Metaphor
Explicit	1.00	.72*	.70*
Implicit	-	1.00	.84*
Metaphor	-	-	1.00

* Value of r significant at $p < .01$ is .393.

Table 6

Correlations Between Explicit, Implicit and Metaphor Scores for Second Grade Cued Recall

	Explicit	Implicit	Metaphor
Explicit	1.00	.74*	.64*
Implicit	-	1.00	.61*
Metaphor	-	-	1.00

* Value of r significant at $p < .01$ is .561.

Table 7

Correlations Between Explicit, Implicit and Metaphor Scores for Second Grade Free Recall

	Explicit	Implicit	Metaphor
Explicit	1.00	.38	-0.12
Implicit	-	1.00	.03
Metaphor	-	-	1.00

* Value of r significant at $p < .01$ is .561.

Table 8

Correlations Between Explicit, Implicit and Metaphor Scores for Fifth Graders

	Explicit	Implicit	Metaphor
Explicit	1.00	.43*	.22
Implicit	-	1.00	.81*
Metaphor	-	-	1.00

* Value of r significant at $p < .01$ is .393.

Table 9

Correlations Between Explicit, Implicit and Metaphor Scores for Fifth Grade Cued Recall

	Explicit	Implicit	Metaphor
Explicit	1.00	.73*	.41
Implicit	-	1.00	.65*
Metaphor	-	-	1.00

* Value of r significant at $p < .01$ is .561.

Table 10

Correlations Between Explicit, Implicit and Metaphor Scores for Fifth Grade Free Recall

	Explicit	Implicit	Metaphor
Explicit	1.00	.38	.19
Implicit	-	1.00	.40
Metaphor	-	-	1.00

* Value of r significant at $p < .01$ is .561.

Table 11

Percentage of Increase in Fifth Graders' Propositional Recall over Second Graders'

Type of Recall	Grade Level		% of Increase
	Second	Fifth	
EXPLICIT	1307	1883	31%
IMPLICIT	1487	1932	23%
METAPHOR	394	582	32%
Total	3188	4397	27%

Note. Data were collasped across task types.

Table 12

Percentage of Increase in Fifth Graders' Propositional Recall over Second Graders' in the Free Condition

Type of Recall	Grade Level		% of Increase
	Second	Fifth	
EXPLICIT	489	909	46%
IMPLICIT	355	574	38%
METAPHOR	6	79	92%
Total	850	1562	46%

Table 13

Percentage of Increase in Fifth Graders' Propositional Recall over Second Graders' in the Cued Condition

Type of Recall	Grade Level		% of Increase
	Second	Fifth	
EXPLICIT	818	974	16%
IMPLICIT	1132	1358	17%
METAPHOR	388	503	23%
Total	2338	2835	18%

Table 14

Percentage of Increase in Propositional Recall from the Free Condition to the Cued

Type of Recall	Recall Condition		% of Increase
	Free	Cued	
EXPLICIT	1398	1792	22%
IMPLICIT	929	2490	63%
METAPHOR	85	891	90%
Total	2412	5173	53%

Note. The data was collasped across grade levels.

Table 15

Pattern of Explicit - Implicit Recall

Recall Condition	Type of Recall		% of Increase
	Explicit	Implicit	
Free Recall			
2nd Grade	489*	355	27%
5th Grade	909*	574	37%
Cued Recall			
2nd Grade	818	1132*	28%
5th Grade	974	1358*	28%

* Increased score.

Table 16

Percentage of Increase in Propositional Recall from the Free Condition to the Cued for Each Grade Level

Type of Recall	Recall Condition		% of Increase
	Free	Cued	
Second Grade			
EXPLICIT	489	818	40%
IMPLICIT	355	1132	69%
METAPHOR	6	388	98%
Fifth Grade			
EXPLICIT	909	974	7%
IMPLICIT	574	1358	58%
METAPHOR	79	503	84%